viti-notes
[understanding grapevine growth]

Research to Practice

Berry development – Up to veraison (Phase 1 and 2)

Viti-note Summary:

- Phase 1
- Environmental impacts on berry development processes
- Key grape quality developments
- Phase 2

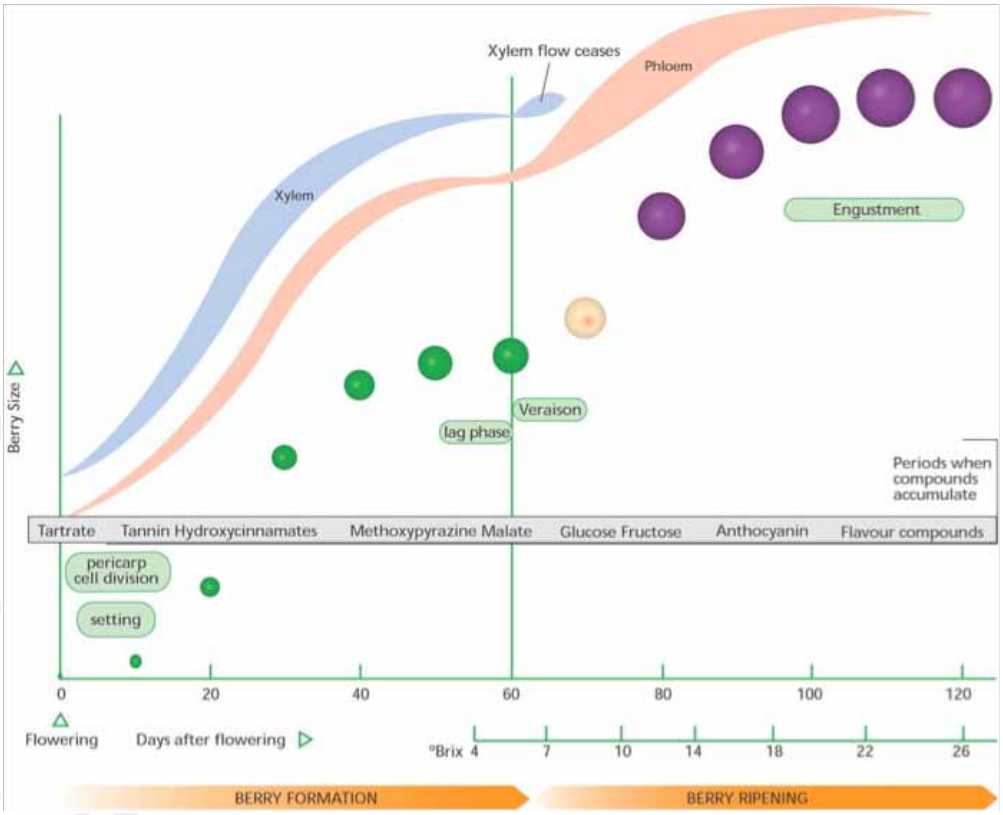

Figure 1. Detailed schematic of berry development. (Illustration by Jordan Koutroumanidis and provided by Don Neel: Practical Winery and Vineyard)

Other topics in this Viti-Notes series include:

- Bud dormancy and budburst
- Spring shoot growth
- Flowering and pollination
- *Berry development - up to veraison*
- Berry development - Ripening
- Defining berry ripeness
- Site factors influencing berry ripening processes and rates of ripening
- Restricted Spring Growth syndrome

Phase 1

The first stage of berry development starts soon after fruitset, and is characterised by growth of the seed and berry. At this point, the final number of cells in the berry is determined and acids accumulate.

Environmental impacts on berry development processes

A minimum amount of light is required for enzyme induction to drive the processes in Phase 1; however, low temperatures slow down enzyme activity and thus may prolong this phase.

Excess water or nitrogen availability can also result in an extended Phase 1, as these can impact on the activity of enzymes and hormones, especially in relation to cell division in the developing pulp and skin, which influences the eventual size and juice content of berries.

Conversely, low soil water can shorten this cell division phase in berries. In this instance, abscisic acid (ABA) is produced in roots in drying soil resulting in smaller berries. Viticulturists may exploit this process to reduce crop load through regulated deficit irrigation (RDI).

Key grape quality developments

Some of the traits that are crucial for many wine styles develop very early during this phase.

Main acids accumulate, i.e. tartaric and malic acids.

- These act as chemical stores of energy and may also be involved in defense of the berry before the seed is fully developed;
- The amount of tartaric acid per berry remains constant during ripening, but its concentration decreases as the berry increases in volume;
- Malic acid is used as an energy source for berry metabolic processes.

Minerals and nitrogenous compounds are imported into berries.

- The import of nitrogen peaks after fruitset;
- In unripe fruit, ammonium represents more than half of the total nitrogen.

Phenolic molecules are made from fruitset onwards; however, the most important period for phenolic development is the 2-3 weeks before veraison.

- Many aroma characteristics develop during this early phase of berry development. These include the methoxypyrazines which contribute to the capsicum/herbaceous flavour in some wines;
- Methoxypyrazines may help to defend the berry against herbivores. The concentration generally decreases as the berry matures, but it may be a desirable fruit characteristic in some varieties, e.g. Sauvignon Blanc;
- Methoxypyrazines might be retained in fruits due to cool conditions, shading of bunches, and minimal water stress.

Phase 2

This is also known as the 'lag' phase as the berry grows only slowly. During this period the embryo within the seed matures and the seed coat lignifies. Towards the end of this phase, the berry starts to soften and to colour—this is known as veraison.

During Phase 2 the berry exhibits slow growth as energy is diverted to development of the seeds.

- ABA is synthesised in the seed and incorporated into the embryo where it inhibits the germination of the seedling at this time;
- Late in Phase 2, ABA is exported into the pulp from the seed, and initiates ripening;
- Lignification of the seed coat begins at the end of this stage.

Phase 2 lasts between 7 and 40 days and the duration depends on both variety and temperature. It is the most temperature-sensitive stage, being delayed by daytime temperatures below 18^{0}C or above 35^{0}C, or night time temperatures below 13^{0}C or above 30^{0}C. Colour development is also delayed when vines experience high temperatures during this phase.

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Further information

Useful references:

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